

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended) A wireless communication system comprising:

a base station;

a plurality of terminals; and

a control unit,

wherein said base station and each terminal of said plurality of terminals are operable to simultaneously perform space division multiplex wireless transmission of information using a same frequency,

wherein at least one terminal of said plurality of terminals communicates with said base station via a plurality of propagation paths,

wherein said base station comprises a base station multi-beam antenna used for the space division multiplex wireless transmission,

wherein said base station multi-beam antenna comprises a plurality of base station antenna elements,

wherein each terminal of said plurality of terminals comprises a terminal multi-beam antenna used for the space division multiplex wireless transmission,

wherein said terminal multi-beam antenna comprises a plurality of terminal antenna elements, ~~and~~

wherein said control unit is operable to orthogonalize a beam pattern of said base station multi-beam antenna, to control thereby controlling the space division multiplex wireless transmission,

wherein each respective terminal of said plurality of terminals is operable to transmit, to

said base station, pilot signals used for estimating a radio-wave-propagation characteristic between the respective terminal and said base station,

wherein said base station is operable to receive the pilot signals,

wherein said control unit is operable to detect a phase and/or an amplitude drift amount of the pilot signals, to calculate a plurality of transfer function values based on the pilot signals,
and

wherein said control unit orthogonalizes the beam pattern of said base station multi-beam antenna based on the plurality of transfer function values that determine the radio-wave-propagation characteristic between said plurality of base station antenna elements and said plurality of terminal antenna elements.

Claims 2-4 (Cancelled)

Claim 5 (Currently Amended) The wireless communication system as claimed in ~~claim 2,~~
claim 1,

wherein said control unit is operable to calculate eigenvectors of a channel matrix having-
~~whose~~ matrix elements ~~are~~ composed of the plurality of transfer function values, and

wherein said control unit is operable to control a set of weight to be imposed on said plurality of base station antenna elements using the eigenvectors of the channel matrix.

Claim 6 (Currently Amended) The wireless communication system as claimed in ~~claim 2,~~
claim 1,

wherein said control unit is operable to calculate a plurality of diagonal elements of a channel matrix ~~having whose~~ matrix elements ~~are~~ composed of the plurality of transfer function values, and

wherein said control unit is operable to control a set of weight to be imposed on said plurality of base station antenna elements using the plurality of diagonal elements of the channel matrix.

Claim 7 (Currently Amended) The wireless communication system as claimed in ~~claim 2,~~
claim 1,

wherein, when one ~~terminal~~ of said plurality of terminals has moved, ~~said the one terminal of said plurality of terminals~~ is operable to transmit, to said base station, movement pilot signals ~~to be~~ used for estimating a radio-wave-propagation characteristic between said one ~~terminal of said plurality of terminals~~ and said base station,

wherein said base station is operable to receive the movement pilot signals,

wherein said control unit is operable to re-calculate a plurality of transfer function values concerning ~~the one of~~ said one terminal ~~plurality of terminals~~, and

wherein said control unit is operable to orthogonalize the beam pattern of said base station multi-beam antenna based on the plurality of re-calculated transfer function values.

Claim 8 (Currently Amended) The wireless communication system as claimed in claim 7, wherein said control unit is operable to re-calculate a plurality of transfer function values concerning an un-moved terminal of ~~one or more un-moved terminals, the one or more un-~~

~~moved terminals belonging to said plurality of terminals.~~

Claim 9 (Currently Amended) The wireless communication system as claimed in claim 7, wherein said control unit is not operable to re-calculate a plurality of transfer function values concerning ~~an one or more un-moved~~ terminal of terminals, ~~the one or more un-moved terminals belonging to~~ said plurality of terminals.

Claim 10 (Currently Amended) The wireless communication system as claimed in claim 7, wherein said control unit, utilizing mobility as a parameter indicating a degree that one terminal of said plurality of terminals has moved in space per unit time, is operable to determine a priority of orthogonalization of the beam pattern of said base station multi-beam antenna.

Claim 11 (Currently Amended) The wireless communication system as claimed in claim 10, wherein said control unit is operable to determine the priority of orthogonalization of the beam pattern of said base station multi-beam antenna such that a priority of one terminal of said plurality of terminals having a certain mobility is higher than a priority of another terminal of said plurality of terminals having a mobility that is greater than the certain mobility.

Claim 12 (Currently Amended) The wireless communication system as claimed in claim 10,

wherein the mobility of said plurality of terminals is expressed in terms of respective identifiers ~~assigned~~ given to said plurality of terminals,

wherein said plurality of terminals are operable to transmit, to said base station, the respective identifiers,

wherein said control unit is operable to receive the respective identifiers transmitted from said plurality of terminals, and

wherein said control unit is operable to determine the priority of orthogonalization of the beam pattern of said base station multi-beam antenna based on the respective identifiers received by said base station.

Claim 13 (Currently Amended) The wireless communication system as claimed in claim 1, wherein said control unit is provided within said base station.

Claim 14 (Currently Amended) A base station ~~for~~ of a wireless communication system comprising said base station and a plurality of terminals, said base station and ~~said the~~ plurality of terminals simultaneously performing space division multiplex wireless transmission of information using a same frequency, and each terminal of said the plurality of terminals comprising a plurality of terminal antenna elements, said base station comprising:

a base station multi-beam antenna comprising a plurality of base station antenna elements; ~~and~~

a CODEC unit operable to encode inputted signals to output a result;

a demodulation unit operable to demodulate the result outputted from said CODEC unit to output a demodulated result;

an antenna-controlling unit operable to control the space division multiplex wireless

transmission via said plurality of base station antenna elements, and to receive the demodulated result, to output sending signals; and

a frequency-converting unit operable to convert a frequency of the sending signals to output a converted result to said base station multi-beam antenna,

wherein said antenna-controlling unit is operable to calculate a plurality of transfer function values that determine ~~determining~~ a radio-wave-propagation characteristic between said plurality of base station antenna elements and ~~said the~~ plurality of terminal antenna elements, to orthogonalize a beam pattern of said base station multi-beam antenna based on the determined radio-wave-propagation characteristic.

Claim 15 (Currently Amended) The base station as claimed in claim 14, wherein said base station further ~~comprises comprising~~ an interference amount-estimating unit operable to estimate an interference amount in a pair of propagation paths between ~~the said~~ plurality of terminals and said base station,

wherein said antenna-controlling unit is operable to ~~determine a~~ determine the beam pattern of said base station multi-beam antenna based on the interference amount estimated by said interference amount-estimating unit.

Claim 16 (Currently Amended) The base station as claimed in claim 14, wherein said base station further ~~comprises comprising~~ a mobility-identifying unit operable to identify a mobility of each ~~terminal of said plurality of terminals~~, the mobility indicating a degree that ~~each terminal~~ one of said plurality of terminals has moved in space per unit time,

wherein said antenna-controlling unit is operable to determine a ~~the~~ beam pattern of said base station multi-beam antenna based on the mobility identified by said mobility-identifying unit.

Claim 17 (Currently Amended) A terminal ~~of for~~ a wireless communication system comprising a base station and a plurality of terminals, each terminal of the said plurality of terminals being composed of said terminal, ~~said the~~ plurality of terminals and ~~said the~~ base station simultaneously performing space division multiplex wireless transmission of information therebetween using a same frequency ~~with each other~~, said terminal comprising:

a terminal multi-beam antenna comprising a plurality of terminal antenna elements; and
a CODEC unit operable to encode inputted signals to output a result;
a demodulation unit operable to demodulate the result outputted from said CODEC unit to output a demodulated result;
an antenna-controlling unit operable to control the space division multiplex wireless transmission via said plurality of terminal antenna elements, and to receive the demodulated result, to output sending signals;

a pilot signal-generating unit operable to generate pilot signals used for estimating-
estimation of a radio-wave-propagation characteristic between the said base station and said terminal; and

a frequency-converting unit operable to convert a frequency of the pilot signals and the sending signals to output a converted result to said terminal multi-beam antenna.

wherein said terminal multi-beam antenna is operable to transmit to the said base station,

the pilot signals generated by said pilot signal-generating unit.

Claim 18 (Currently Amended) The terminal as claimed in claim 17, ~~wherein said terminal further comprising: an antenna-controlling unit operable to control wireless communications via said plurality of terminal antenna elements, and~~

wherein said antenna-controlling unit is operable to cancel, after said the base station has orthogonalized a beam pattern of the antenna-controlling unit thereof, an interference wave by utilizing at least one of a zero forcing method and a maximum likelihood estimation method.

Claims 19-23 (Cancelled)